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ALEXANDER

ON THE

SEA AND SPAW WATERS.

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Francis Gray Smart.



A
TREATISE
ON THE
VARIOUS MODES OF BATHING,
WITH THE
ANALYSES
OF THE
MINERAL SPRINGS
OF SCARBOROUGH,
AND ALL THEIR MEDICINAL USES.

BY W. ALEXANDER,

GRAD. IN PHYSIC OF THE UNIVERSITY OF EDINBURGH; LIC. OF THE
ROYAL COL. OF SURGEONS AND APOTH. E.; AUTHOR OF A TREATISE
ON INDIGESTION, A SKETCH OF THE MANNERS AND CUSTOMS OF
SAILORS, AND RESIDENT SURGEON AT SCARBOROUGH.

I AM PERSUADED MINERAL WATERS, WHICH ARE PROVIDED
BY NATURE, ARE THE BEST, PERHAPS THE ONLY REAL REMEDIES.

LADY MARY WORTLEY MONTAGUE.

PART SECOND.

SCARBOROUGH:

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CHAPTER I.

Prefatory Observations.



The relation which the sea and mineral waters generally, as internal remedies, bear to the subject of the foregoing volume. Early use of mineral springs, and the confidence reposed in natural remedies in all ages. New view, &c. &c.



Scire potestates Aquarum, usumque bibendi.

VIRG.



The value of mineral springs must have been for ages acknowledged, since all researches undertaken to discover their first application as curative means, to the infirmities of the flesh,

have proved fruitless, and usually dissipated in the endless mists of time. Their existence is doubtless coeval with animal life itself; and the confidence reposed in *natural* remedies at every known period of the world, has formed a remarkable and almost universal epoch in the history of all nations, and confers upon mineral fountains a medical reputation, which neither the substitutions of art, nor the scepticisms of the day, can in any way entirely efface. All spring waters may be regarded as mineralized, but the common acceptation of the word would limit its signification to those possessed of such powers as entitle them to be employed for medicinal purposes, and it is highly probable that man early discovered their properties as distinct from the effects of common water, and attracted by their mysterious qualities, became the patron and advocate of their use, destined to be more fully established by the concurring testimony and accumulated experience of succeeding generations.

The usefulness, indeed, of mineral waters does not rest exclusively on the authority of

antiquity, although confirmed by Holy Writ, and attested by the Father of medicine, for we may appeal to the stately palaces erected within the last half century, on sites not otherwise possessed of qualities beyond their claim as places of salubrity, sometimes natural beauty of country, but oftener for their springs and baths, as evidences of their present estimation among mankind, and the sense and taste displayed in annually resorting to them ;—nay in this country we may refer to Gloucester's modern Cheltenham, with its Well-Walks, and other beauties, designed to attract and minister to the health and entertainment of the visiter,—to Somerset's Roman city, Bath, of Bladud notoriety, favoured by nature in picturesque effect, ornamented by public buildings, and enlivened by its Vauxhall Gardens, exquisitely laid out in lawns, vistas, groves, winding paths, shaded bowers, waterfalls, grottoes, alcoves, and labyrinths, bounded by the meandering waters of the Avon,—to Sussex's seat of fashion, Brighton, of mushroom origin as a watering-place, though possessed of a chalybeate, and the advantages of the coast, defended from the north-east

winter's blasts by the hills in its rear, and adorned by the presence of Royalty. These and some other places of general resort, might be adduced as examples of the acknowledged benefits derivable from a visit to such scenes of pleasure and stores of health, for that crescents and squares of noble buildings should be raised, and grounds devoted to gardens and promenades, frequently in sequestered haunts, far distant from the busy hum of trade and other occupations of life, that commonly assemble in numbers men together, strongly imply, that watering-places are very generally admitted to have a conspicuous hold on public confidence. Thus it is, that situations formerly remote and unfrequented have risen to eminence, been converted into places of ease and opulence, decorated by the embellishments of art, and finally become the residence of princes.

The efficacy of the waters and the salubrity of the air are undoubtedly not the only causes, which operate in inducing the patrician public to visit these famous and favoured fountains, some of which owe their celebrity, as much to

the patronage of fashion as to the virtues of their springs, for,

“Fashion in every thing bears solemn sway,
And words, and public haunts, have each their day.”

The waters, however, have in general, first attracted attention, but the real utility of such places in all cases, depends on a multiplicity of combined causes, tending to promote tranquillity and entertainment of the mind, alternate repose and exercise of the body, and the necessary regularity of the animal, vital, and organic functions, which constitute life, and maintain, in all its integrity, the health. It is to the *aggregate change* effected in the system, that the benefit derived from a trip to the spas is properly to be referred, rather than singly to the value of the baths or the purity of the springs; and this change is wrought through the operation of all those influences, which create, often by in-appreciable means, almost a revolution of nature. If the indisposition that has led the invalid to quit the comforts of his home, be indigestion, the release from sedentary or mental occupations, will greatly favour and promote the salutary

effects of a gently stimulating chalybeate; as a tonic, which together with exercise and amusement, will secure digestion, and restore appetite. If he have laboured under inflammation, or been consumed by the scorching and quenchless fire of fever;—if the summer heat shall have relaxed the system, or a protracted bowel complaint have well nigh exhausted the strength;—if his nerves have become shattered by irregularities, or his intellectual faculties impaired by excessive study, application to confining duties, or deficiency of sleep,—the sea breeze will prove a restorative of no mean value, and the chalybeate a cordial to heal and brace the languid frame.

Previously to the close of the seventeenth century, the number of votaries at the shrine of spaw-ism was greater than at the present day, when by lacking faith in the omnipotence of the wells, one of the qualities attendant on their use is lost, and one too to which some of their virtues may be chiefly attributed. It was not until this period that the composition

and nature of mineral waters were understood or at all accurately examined, since which time, their alleged marvellous effects have alternately formed the subject of praise, astonishment, and ridicule, and in proportion to their former credit in public estimation, in the same ratio, with many people, has been their insolvency in later times. The fact is, as may be well expressed in the language of the immortal Horace,

“Est modus in rebus; sunt certi denique fines,
Quos ultra citraque nequit consistere rectum.”

They are entitled, to a *certain degree* of confidence in *suitable cases*, and although possessed of but a small quantity of saline matter, may now be safely advocated on scientific principles, as important remedies, distinct from their admitted properties as tonic, aperient, and diuretic.

I allude to the recently demonstrated effects of saline matters when largely diluted in a watery menstruum *on the blood*, or in other words, to the doctrines of Stevens, as first applied to the yellow fever in the West Indies,

and subsequently extended to the cholera, as it occurred in this country. To chemical analysis we are indebted for the knowledge that in some, and probably in many, morbid conditions of the body, there is an excess or deficiency of certain constituent principles above or below those assigned to healthy blood, as the standard of comparison. It would be foreign in a popular work to enter at large on this subject, but if the scientific inquirer will bear these circumstances in mind, together with the physiological fact of venous absorption within the human stomach, he will be enabled to make deductions that will necessarily invest mineral waters with powers and effects on the animal economy, which, although they may have been experienced, have, I believe, never hitherto on the same grounds, been explained. I predict, indeed, that the solution of that problem, which places the alleged effects of spaw waters at variance and inconsistent with their known nature, will on this principle ultimately be established.

If the theory of Hahnemann were admitted,

or by future investigations proved to possess some merit and accord with experience, it would greatly confirm any view founded on the virtues of medicinal substances when administered in *extremely divisible doses*, and although no disciple of his school, yet I am convinced that mineral waters owe very much of their value to this property, effected by the watery menstruum. The extreme tenuity of the fluid, and its bulk being exposed to an extended surface within the stomach, are most likely the causes which favor its absorption, and having arrived within the vessels, it so acts upon the blood as to provide a healthy serum, by dilution of it, promote secretion, and by readening the clot, foster that close and necessary union of action and dependence on each other, that subsists between the nerves and blood vessels.

On this principle therefore, the most plausible ground which has been urged as an objection to mineral springs, viz., their *paucity of saline contents*, is deemed to be that on which their virtues mainly depend, and if considered as

established, will remove the only argument which seemed *a priori* to be entitled to any weight.

The effects of mineral waters as well as of many classes of medicines, are not always obvious to the senses, but it by no means necessarily follows, that they are not executing some good purposes, any more than that the heart is not beating or our food digesting, because they do so imperceptibly. But among the salts possessed of sensible effects, one familiar example will be furnished, in evidence that saline matters when largely dissolved in water have their properties *greatly augmented* by dilution, and if this fact be admitted in one, two, or three salts, and it is indisputable, why not extend the principle to all, although in lacking perhaps sensible qualities in many cases it cannot be made manifest. By analogy however, it must be inferred; and will be found in accordance with their acknowledged absorption and action on the blood as already explained. If one ounce of Epsom salts be dissolved in one ounce and a half of

water, and swallowed, it will commonly be succeeded in due time by certain appreciable effects. Should half the quantity of the same salt, however, be dissolved in a pint of water, and in like manner taken, an equal, at least, but usually a greater effect will be produced, displaying the augmentation of property by *dilution*.

Since mineral waters are thus affirmed to possess a claim on public confidence, a question arises as to whether their artificial preparation will supply a substitute to those invalids who from the nature of their complaints, from a desire to continue under the care of their ordinary medical adviser, or from other imperious circumstances, are prevented from resorting to the natural wells. It may be answered in the negative; for setting aside the advantages of change of air, habits, and occupation, attendant on a visit to the spas, the waters cannot be used in all the perfection of their original composition, as notwithstanding the labours of hydro-analysts, the march of chemistry, and the elaborate skill and

accuracy bestowed upon their preparation, yet they have not proved identical in their chemical composition and medical efficacy with the natural springs. In many cases it is probable that the whole of the ingredients that enter into their formation are not yet discovered, for some of which we possibly know not the appropriate tests,—how much less likely is it, therefore, that we can succeed in making an exact imitation of the waters as they exist in nature, or effect those hidden combinations and associations, which however seem uniformly to be performed on the laws of definite proportions and elective attraction. The Ems-water, as prepared by the celebrated Struve, of Dresden, differs both in taste and operation from the natural springs, and the Scarborough and Harrowgate waters, as artificially made in my own laboratory, deposited flocci by the third day of their preparation, the former of a yellow and the latter of a paler color. The hand of nature, indeed is the only true method, by which we can obtain the virtues of mineral waters in all their power and purity. The strongest of the chalybeate springs do not con-

tain more than 5 grains of the carbonate of iron in a gallon of the water, the real quantity of this tonic received at a single dose into the stomach, or contained in a pint, is therefore extremely small, but, nevertheless, it will exert a more salutary influence upon the system, according to Dr. Saunders, than twenty times the dose of the artificial carbonate in our ordinary prescriptions. Moreover, the effects of the waters differ from, and are altogether disproportionate to, the results which we should expect to find from their known chemical analysis.

It has been my great object throughout this book, to attach just as much importance to the various subjects contained in it as they respectively deserve, *and not more*, and while I am willing to admit that the application of mineral waters for the alleviation and cure of human infirmities is properly limited to certain classes of complaints, and even of those only when in particular stages, yet I shall always be found ready to make a determined stand against those vain aspersions of charlatanry.

and empiricism, which the philosophy of the day, with plausible ingenuity, has sometimes endeavoured to envelope the results of that patient, scientific, and comprehensive enquiry, which has led to an elaborate examination of some very valuable auxiliary therapeutical agents, and has declared mineral waters to be those “perrennial springs, which, issuing from the bowels of the earth, are charged with principles to which reason and experience alike award medical virtues.” We must not regard them as confined to the results of the chemist, for the salts obtained through analysis, by means of evaporation, or any other process, may have been *produced* during the operation, but as the results of the synthesis or combination of nature ; and I have shewn the futility of the attempts of art in their imitation, and that their acknowledged effects are oftentimes at variance with their known composition, and saline impregnation, which if duly considered, will go far to reconcile the discrepancy of opinion that has existed upon the subject, while to those who would affect to dismiss the matter after the fashion of the times, I would

apply the quotation used by a friend and fellow graduate, of 1830, in his Inaugural Dissertation on Homoeopathia,

"Quanto plures cachinnare aliquid, quam intelligere possunt."

The bountiful hand of Providence with great profusion has scattered abroad waters, which experience and science have shewn to exert considerable influence upon the functions of animal life. But it is a very limited view of the subject, when we confine our observations to the details of the analyses and medicinal effects of mineral springs; for, together with the phenomena presented by volcanoes, they form a link in that chain of investigation, that is probably destined to disclose to us the internal constitution of the globe itself. Their relation to this great physical problem, and to other departments of science and art, demonstrates their importance as subjects of inquiry to the naturalist, the chemist, the mineralogist, and the physician. How deeply do hot springs excite the meditations of the geologist, from their connexion with the general question of the temperature of the earth, and with the

local developement of volcanic agency!! How striking is the contrast between the icy crystal streams that rise from the glaciers of Switzerland and the boiling geysers of Heckla, Stromboli, Etna, and Vesuvius! and how varied are their relations to the general cosmical system, when regarded in a comprehensive and philosophic point of view!

The theories advanced relative to the *origin* of the water of mineral springs, and the causes which influence their temperatures and composition, although deeply interesting, will not be expected to be discussed in the pages of this volume, for to do them and the subject adequate justice, the limits of it would prove altogether insufficient for the purpose, and my reader is probably more desirous to view me in my medical character than as a speculative inductive philosopher. Much, however, has been done in elucidation of this department of inquiry, by the united efforts of the chemist, the geologist, and the mathematician, who have applied the resources of their respective branches of science to the explanation of

volcanic phenomena, and the constitution and origin of mineral waters generally.

The water of springs, of whatever description, must be derived from one or more of these sources, viz., from the waters of the atmosphere, which after sinking to a certain depth, re-appear on the surface of the earth, emerging through the soil or rock,—from the focus of present or past volcanic activity,—from the great mass of the ocean,—or from large subterranean reservoirs of this fluid. It is more than probable that those mineral waters which vary in their quantity, impregnation, and temperature, either periodically with the seasons, or after the lapse of a number of years, and those temporary streams observed at the foot of hills, derive their origin directly from atmospheric moisture, percolating the rents, and fissures of the rocky strata, and destined to appear again below ; but the impenetrable beds of clay, massive granite, compact kneiss, and mica slate strata of the earth's crust, would oppose its passage to any great depth within its bosom, while assuredly the water of boiling

springs, which emerge on the verge of perpetual snows, at an altitude of 13,000 feet above the level of the sea, as at the Himalayah mountains, cannot be derived from the atmosphere, not to mention the peculiar relations of the Icelandic geysers, and the volcanic eruptions of the Andes, which consist of torrents of mud and boiling water.

Thermal springs are seldom found in extensive plains, remote from mountain ridges, but are abundant enough, and possess the highest temperatures when in the vicinity of active volcanoes, whose localities are for the most part islands rising out amidst the ocean, or if situated on the great continent, will be found at no great distance from the coast. These facts seem to lead to two natural inferences, first, that hot springs very often owe their temperature to subterranean fire; and secondly, that proximity to the sea is one of the necessary conditions for the production of volcanic energy. The immense quantity of water ejected at the mouths of their craters can only be derived from two sources, first,

either from reservoirs existing in the centre of the planet we inhabit, and secondly, from direct communication with the sea, effected by filtration through the pores of the earth, and absorbed, contrary to gravity, by capillary attraction, or forced up by atmospheric pressure, and the weight of the superincumbent waters. The former supposition is rendered improbable for several reasons, among which may be mentioned, the fact as stated by Dr. Black, that pits and mines become drier the deeper they go, and that according to the researches and experiments of Cavendish, and others, the globe is 4.9 or we say five times heavier than its own bulk of water.

Thermal waters undoubtedly arise in places where it would be difficult to demonstrate their connexion and dependence on volcanism, and which unquestionably owe their heat to other causes. And there is an important point of late revealed, relative to the temperature of the earth, at different depths from its surface, which is pertinent alike to hot and cold springs, and may lead to a more intimate knowledge of

their true origin, and disclose how far their saline impregnation is dependent on the solution of the rocky strata through which they pass. It has been long known that the heat of the earth increases with the distance downwards from the surface, but it remained to be ascertained, whether that increase of temperature was progressive or could be found to observe any certain definite ratio appreciable in numbers. By a series of close, accurate, and unobjectionable experiments, this object is apparently accomplished, and the mean rate of increase of terrestrial temperature with the depth, is declared to be 43.9, or about 44 feet for every degree indicated by Fahrenheit's thermometer. In some ranges of mountains we find both thermal and cold springs to occur on the same range, but their respective elevations in such instances always differ,—the thermal uniformly occupying the lower part or foot of the mount. The inference to be drawn from this fact in relation to the earth's temperature is obvious.

The mean temperature of the earth in all

northern and southern habitable countries as we approach the poles, is fortunately higher than that of the air there, or animal and vegetable life must have long since ceased to exist, for how could colonization and culture take place on a soil whose temperature was 5° below the freezing point of water? we might have looked in vain for the flourishing towns and profitable harvests now existing in situations possessed of no higher atmospheric temperature.

I have thus endeavoured to prove that the earth is possessed of *innate heat*, wholly independent of solar and atmospheric influence, and now come to the conclusion, that mineral waters, principally, if not entirely, owe their temperatures to it. And had it formed a part of my plan, in this essay, to treat of thermal springs, no difficulty would have arisen in establishing a scale of distinct and oftentimes augmented effects upon the body, according to their relative temperature.

CHAPTER II.

THE SCARBOROUGH SPAW.



Discovery of the Spaw Water. Dr. Wittie first recorded the history of the Spaw and analysed the Springs. Subsequent researches. The opinion entertained by the celebrated Dr. Mead as to the value of these waters. Results of the analyses of the springs. The value of analyses in judging of the real effects and virtues of a spring. Saline and gaseous contents of the waters individually considered, &c., &c.

Tales præcipue sunt aquæ, qualis terra per quam fluunt.—PLINY.

It is stated in Hinderwell's History, that the mineral springs of this spaw were accidentally discovered to possess medicinal pro-

perties so early as the year 1620, and subsequently became the ordinary physic of the inhabitants of the town. Their reputation rapidly extended, and has now been maintained with unusually trifling variation for upwards of two centuries.

An anecdote is related of one of the governors of the Spaw who lived far from temperately, but had, nevertheless, arrived at the advanced age of 103 years, in the full possession of his faculties, and with few bodily infirmities. "Whenever he was questioned respecting his regimen, he usually replied, that he had always lived well, and when sick the spaw water was his sovereign remedy."

It would prove tedious to the reader, and answer but little purpose, to enquire at any length into the works which have been written on the subject of this celebrated spaw, or to detail the acrimony with which the earlier authors supported their respective controversial views, and as chemistry and medicine have since those periods assumed new features, we

can readily dispense with the twaddle and gross personality, that for the most part characterised these splenetic effusions of rivalry at the dawn of science. Dr. Wittie, however, has the merit of having, in 1660, recorded the early history of the spaw, and given the first analysis of the springs. Dr. W. Simpson, in 1669, published a criticism on the Treatise entitled "Scarborough Spaw," of Dr. Wittie, in which he calls into question this gentleman's chemical knowledge, and desiring no adventitious aid to favour his opinions in the dispute or to patronize his work, rests his claim to public confidence in these words; "*prævalet ipsa veritas! imo in æternum prævalebit!*" Dr. Tunstal, in the same year, committed to print the results of his researches. Dr. Simpson's work recalled Dr. Wittie to the field in a rejoinder. Dr. Short succeeded them in 1734, and found that a gallon of the chalybeate yielded, by evaporation, 220 grains of solid residuum. About the same time, Dr. Lucas discovered the purging water to contain 320 grains in the same quantity, though Dr. P. Shaw in the same year got only 240, but Dr.

Rutty afterwards obtained 284 grains.

Dr. Shaw's "Inquiry into the contents, virtues, and uses of the Scarborough Spaw," is properly considered as a great effort of genius for the time at which it was written. He entertained a high opinion of the usefulness of the wells, and in his dedication to the celebrated Dr. Mead, of London, points out one of the causes that tended to establish Scarborough as a fashionable watering place, in these words; "These waters, fraught with virtues known to few, and healing chiefly the sick of inferior rank, are at length, by your experience and subsequent just and generous recommendation of them, introduced into better company, and now cheer the spirits and brace the nerves of peers as well as commoners."

In the interval of 1734, when Dr. Shaw wrote, and 1763, these mineral springs were submitted to analysis by Sir George Baker, Dr. Heberden, and Mr. John Travis, and in 1798, by Dr. Belcombe, who is the latest author on the subject. The only matter, how-

ever, so far as I know, which he has furnished, besides the analyses to be found in Hinderwell's history, is a fragment, (for which I am indebted to a respected member of the late Doctor's family,) relating to the effects and uses of the springs, which is truly valuable, in so far as it affords the results of ten years' experience in their employment, and I shall, therefore, extract some passages from it, when engaged in the consideration of that part of my subject.

According to the experiments I have instituted, the results of the analyses differ in some measure from all antecedent ones, not so much in the salts themselves, as their quantities, and the gases with which the waters are imbued. The direct and indirect modes were severally applied, and since they each furnished different results, for reasons that will shortly be explained, we can only hope for an approximation to the *exact* constitution of the waters, and must rest satisfied with constructing our analysis on the knowledge of the quantity of acid and base contained, and speculate as to their affinities and actual state of union in the natural and undisturbed springs.

NORTH WELL.*

Temperature 46°, Specific Gravity 10,033.23

IN EACH GALLON.

Carbonic Acid128 Cubic inches.

Oxide of Iron 2.25

Sulphate of Magnesia90

Muriate ————— 8

Sulphate of Soda 2.5

Muriate ————— 3.25

Carbonate of Lime30

Sulphate —————44

Muriate —————12

 192.00

SOUTH WELL.

Temperature 46°, Specific Gravity 10,038.06

IN EACH GALLON.

Carbonic Acid120 Cubic inches.

Oxide of Iron 1.5

Sulphate of Magnesia...100

Muriate ————— 20

Sulphate of Soda 7

Muriate ————— 5

Carbonate of Lime..... 24

Sulphate ————— 14

Muriate ————— 9

 180.5

* See Appendix.

Although the improved chemical analysis of the present day enables us to determine with sufficient accuracy, the quantities and essential constituents of mineral springs, yet it supplies only for them what a knowledge of anatomy is for the human body,—it constitutes the basis of our acquaintance with their composition ; and when regarding them as medicinal agents, it should not be forgotten, that analysis dissolves the bond of connexion between the different substances, as they are associated in the secret laboratories of nature, distinct from the arbitrary, imperfect, and often hypothetical combinations of the chemist. A knowledge of the proportion of acids and bases contained in a mineral water, enables the physician to form a *general estimate* of its medicinal virtues, from its synthetical resemblance to one, with the *exact effects* of which he is already well acquainted, and it is, therefore, through this means, that he would found a rational theory of its operation. But, nevertheless, experience should go hand in hand with the chemist, in judging of the real effects of every spring.

It is probable that mineral waters owe their saline and gaseous impregnation, generally, to the processes of solution, sublimation, and lixiviation, existing in the earth's interior, aided by hidden but omnipotent influences. There is no where, however, in nature, a chemically pure water, for it is the great, the universal solvent, and is constantly exposed to the influence of light, heat, air, and matter,—all agents incessantly at work changing its original purity.

There is scarcely a subject more worthy of profound meditation, or better calculated to excite a lively interest in the mind than the origin of those inexhaustible springs, which for a long succession of ages have poured forth such enormous quantities of saline and gaseous matters, without any sensible diminution in their quantity, temperature, or degree of mineral impregnation. Nor need we dive far into the interior of the earth to learn the effects and operation of those hidden causes of heat, mass, time, and pressure, which are probably instrumental in the production of

those varied features which mineral waters present. The inquiry is a difficult one, and not fitted for these pages, but though the true secret should never be revealed, it is important to demonstrate in what manner they might be formed, by the creative energies exercised within the bowels of the earth.

Did we find the solid ingredients with which mineral waters are charged, already prepared in masses, and forming strata in the solid crust of the earth, it would be an easy matter to ascertain their composition, and trace their origin from such sources ; but, such is not often the case, and it is necessary, therefore, to enquire for other probable causes in the discovery of their formation. But it is a remarkable fact, that in a large proportion of mineral waters, the ingredients are identical with those discharged from the interior of the earth by volcanic eruptions, or found in fissures of the crater and lava masses, in the form of sublimations. The origin of the ingredients of all such might be ascribed to a general case, while a second class, which are found to vary with the tem-

perature, dryness, or moisture of the seasons, may be regarded as the local products of certain strata, permeated by atmospheric moisture, dissolving the substances with which it comes in contact in its subterranean channels.

If Davy's hypothesis, which regarded the crust of the earth as the result of a grand process of oxidation, and its interior as composed of the bases of the earths which enter most abundantly into its composition, could be substantiated, all difficulty in the investigation as to the sources from whence the solid and gaseous impregnation of mineral waters were derived would cease to exist, and the phenomena attending volcanoes and the production of hot and cold springs and their ingredients be readily explained. The experiments and calculations of Maskelyne and Cavendish assign to our globe, a specific gravity, of no less than five times that of water, being fully one-third more than the mean density of its rocky crust. If this point be deemed established, it might tend to support

Davy's view of the metallic nature of the interior of our planet.

The waters of the Scarborough spaw issue at the foot of a diluvial cliff, on the south side of the town, at a very trifling elevation from the level of the sea. It does not however necessarily follow as in the case of those waters which emerge from granite, or some point of the crust of the earth, inferior to it, that they are originally derived from this formation, as they may have traversed many, but nevertheless a certain uniformity is commonly discovered in the nature of the neighbouring rocks and the composition of the springs which flow from them. There are two classes of mineral waters, however, whose geological relations are frequently obvious, viz., those thermal springs which rise in the vicinity of, or directly from, active volcanoes; and those brine springs, whose *matrices*, or parent formations, are clearly seen to be rock-salt deposits.

The foreign ingredients of ordinary springs, or those used for domestic purposes, are derived immediately from the soil out of which they issue, and when they exude from a sandy or silicious matrix are very pure, and have a greater specific gravity than other terrestrial waters, with the exception of the sea.

The mere altitude in the position of mineral waters seems to exert no influence in the temperature and composition of them, beyond the fact already stated, that where there are two sets of springs, hot and cold, in the same hilly range, the former of these occupy the lower elevation.

The alkaline and earthy salts constitute the great proportion of the solid matters contained in the Scarborough waters. The bases of these salts are magnesia, soda, and lime, all of which enter largely into the composition of the solid crust of the globe. The acids found in union with these bases, are the sulphuric, muriatic, and carbonic. These principles,

together with the oxide of iron, in various combinations and proportions, form the purging, and salinely carbonated chalybeate.

My experiments furnish no nitrogen or azote in the Scarborough waters, but such as I consider to be neutralized by oxygen in those proportions which constitute atmospheric air. It is indeed of rare occurrence in cold springs, whilst atmospheric air is universal, and pervades, in certain proportions, all exposed within its influence, and the idea of its existence in these waters has probably arisen from this circumstance, that having obtained carbonic acid gas within the jar, intermixed however with the common air contained in the water, the means used to decompose the former, have taken away also the oxygen of the latter, leaving the nitrogen marked by its negative qualities to itself. That oxygen, distinct from carbonic acid, is contained in the jar, is clear from the fact of a lighted taper continuing to burn in it for a short time. In Thermal springs, however, azote is much more abundant. In the Buxton water it is almost

the sole gaseous constituent, and forms 95 per cent of the gas which bubbles up in the Bath waters.

The other gaseous fluid contained in the Scarborough waters is carbonic acid, or fixed air, which is diffused throughout and plays an important part alike in the composition and medical effects of the springs, as it holds the iron in a state of solution, and enables the stomach to bear a quantity of the cold liquid without oppression. It does not, however, appear to be in so great a quantity, as when the waters were submitted to the analyses of Doctors Higgins and Belcombe. But its fugitiveness is striking, as is seen best in highly acidulated chalybeates, such as are found at Tunbridge, Hartfell, and Cheltenham, and may be observed likewise at Scarborough, by the ochreous deposit found in the bed of the water or adhering to the pipe, separated by the gentle agitation which it undergoes in its descent. Other circumstances may also account for the discrepancy in the results of our analyses, such as the distance the waters were

taken, and the time allowed to expire, prior to submitting them to examination in each case, independently of the circumstance already alluded to, that what they regarded as azote I conceive to be atmospheric air, whose oxygen appears to have been viewed as a part of the combined carbonic acid. This supposition would go far to reconcile the difference between us, but it is probable from the statements of early hydro-analysts, that the waters have undergone some change, or we should not have discovered so great a difference as the following table exhibits, in the solid residuum of a gallon of the water as it flows into the South Well, whatever varieties in the temperature employed in its evaporation.

NAME.	YEAR.	QUANTITY SALINE MATTER.
Lucas.....	1734	320 grains.
Shaw	—	240
Rutty.....	unknown	284
Belcombe	1798	237
Alexander.....	1832-33	180

The origin of carbonic acid as it emerges from the bowels of the earth, has engaged

much of the attention of philosophers, but amid the various opinions that have been advanced upon this difficult subject, that is daily gaining ground, which regards it as the result of terrestrial heat causing calcination of the carbonate of lime or common limestone, which is known to exist in so great abundance, (second indeed in quantity to silica itself,) in the solid crust of the earth, so far as it has yet been explored by man. This view of its origin is strengthened by the impossibility of its being evolved from the combustion of coal, or formed by the direct union of its elements, and the fact that among the numerous examples of disrupted strata discharged from volcanoes, there are none so common as fragments of limestone. It might be disengaged by the action of sulphuric acid upon limestone, but sulphur is necessary to the formation of this acid, and this element exists, so far as is known, only partially, being chiefly the product of volcanic energy, and could scarcely, therefore, supply the enormous volumes of this gas, which, impregnating so generally all waters, issue in all quarters from

the surface of the earth. It is true, that limestone is a bad conductor of caloric or heat, and were it not that the intense heat to which it is thus exposed caused rents and fissures, there would be a limit to the evolution of this gas, which, however, is enabled by this means, to make its exit and find the caustic lime in a favourable state for solution, hence the general prevalence of carbonate of lime in mineral springs, and its frequently extraordinary quantity.

The next great acid I have to allude to, as existing in combination with the bases of the Scarborough waters, is the sulphuric, which may be formed either as a product of the union of its elements or as an educt from some sulphuret. It is very probable that iron-pyrites is the source of the sulphuric acid contained in many chalybeate springs, but more particularly the alumino-sulphate of iron waters, such as Horley Green, near Halifax, and those found in the Isle of Wight. When the sulphates predominate in a mineral water, it generally contains muriates and carbonates, but with

only a small quantity of free carbonic acid. And this law accords with my analyses of the Scarborough Spaw, in which the sulphate of magnesia most predominates, and I have, therefore, called the south well the Purging Water, though a subordinate ingredient in a chemical sense, may play the most important part in the medical effects of a water, as the iron for instance in the North Well. The sulphate of magnesia is generally associated with the sulphates of soda and lime in most waters, but particularly in those possessing iron, and the sulphate of soda will appear by my analysis as an ingredient of the Scarborough waters for the first time. It is, however, in subordinate proportion. The springs of Cheltenham contain 81.04 parts in 10,000 of this salt. The springs of Seidlitz, in Bohemia, contain a large quantity of the sulphate of magnesia. The sulphate of lime is largely diffused in mineral waters, always in the vicinity of gypsum deposits, but never associated with the carbonate of soda. The carbonate of lime is generally associated with the sulphate, and in some thermal waters where its salubility is

aided by a high temperature and an excess of carbonic acid, it exercises considerable formative changes upon the physiognomy of the earth's surface, as for example, the enormous calcareous vault which forms the receptacle of the boiling Sprudel in Bohemia.

Muriatic acid in all probability exists as a muriate in the bowels of the earth, and is not formed by the union of its elements, but may be separated from its combinations there, by sulphuric acid, or by sulphur aided by heat. The muriate of soda is the most frequent of these combinations, and may either be derived from immense masses of rock-salt, in primitive rocks, or from sea water, when in the vicinity of volcanoes. In 1822, the crater of Vesuvius discharged so large a quantity of the muriate of soda, or common salt, as to supply the inhabitants of the neighbouring villages with it for culinary purposes for several days. But in the language of an esteemed author and fellow graduate, "volcanic rocks and mineral springs do not stand to one another in the relation of cause and

effect, but are the effects of one common cause, the vast central igneous focus; and so long as the gaseous products are retained by the pressure of the superincumbent rocky strata, their elastic force progressively increases till it becomes capable of rending asunder the solid crust of the globe, and of clearing for itself a passage into outer space. Should they, however, find a ready ascent through fissures already existing, such an accumulation of elastic force cannot take place, volcanic eruptions will not occur, and there will be substituted for them the permanent and peaceful ascent of mineral springs."

The muriates of magnesia and soda are admitted to be present in the Searboro' waters, and I have introduced for the first time, another salt, viz., the muriate of lime, as it is generally found associated with the former in mineral springs according to Dr. Murray's view of their constitution, and secondly, because I think that were there so much carbonate and sulphate as Dr. Belcombe's analyses indicate, a portion would be deposited in the earlier stages of the opera-

tion of their evaporation by heat, or when otherwise deprived of bulk of menstruum and free carbonic acid. But it must be confessed that we are still in a great measure ignorant of the real state in which substances exist in mineral waters, being often forced after the separation of the constituents into their simplest proximate elements, to re-construct a system of combinations, upon entirely hypothetical and arbitrary suppositions.

Magnesia, lime, and iron, are very extensively distributed in the solid crust of the globe, and their origin as constituents of mineral waters in combination with the acids, whose probable sources have already been explained, will now be obvious, nor will the reader be surprised to learn, that they are to be found in various combinations in mineral springs. Scarcely any cold spring is entirely destitute of iron, and it is the quantity of this metal contained, and its being medicinally, the predominant ingredient of the water, that constitute a chalybeate. The North Spring at Scarborough, is strictly a chalybeate-saline, but may

be considered as chalybeate. It occurs here as the carbonate of the prot-oxide, and is deposited in the form of an oxide, as the water comes in contact with the air, owing to the escape of the carbonic acid. Iron is always a chemically subordinate ingredient in the constitution of mineral waters, never exceeding 5 grains in a gallon.

CHAPTER III.

MEDICINAL AND PHYSICAL EFFECTS OF THE SCARBOROUGH WATERS.



Effects of mineral waters founded on experience and the known therapeutical qualities of their saline contents. Berthollet's view of the association of the salts in a natural water. Particular properties of the Scarbro' waters. The North Well. The South Well, &c.



Siquidem Deus Omnipotens summas et longe præstantissimas in aquis recondidit soterias vires, quarum tanta est excellentia, tantaque utilitas, ut longe multumque omnibus aliis remedium generibus sint superiores.—HOFFMAN.



On entering into the consideration of the effects of mineral waters upon the organism and functions of the human body, two points of difficulty in arriving at sound conclusions

are presented,—the one which would regard them solely on their specific characters as the result of a series of well directed experiments, or in other words, by experience,—the other in explaining their operation, as is applicable to other remedies, upon general principles of therapeutical agency. Neither of these views, singly, will satisfactorily suffice to elucidate the various phenomena observed in relation to them. Water is the only property common to mineral springs, upon which much of their efficacy depends, its action being clearly diuretic and diaphoretic, independent of saline impregnation, which, however, through its influence, under great dilution, is rendered more diffusible over the system, penetrating the secretory organs, resolving obstruction, and exercising, possibly, unknown effects upon the great circulating fluid. Hence it is necessary in estimating the medicinal effects of a water, to ascertain what is to be referred to the mere water, and what to the foreign ingredients contained, and so on, but it is still more important to consider its several relations as *a whole*, and not to suppose certain virtues as necessarily accompanying a

certain chemical composition, but to ascribe due agency to the several combined causes attendant on its use, such as the moral influence of the mind, the extreme divisibility of the salts and the tenuity of their menstruum, the salts themselves and their quantity, the water as a diluent, the exercise taken to aid its operation, its temperature, and the aggregate results of many trials of it.

With respect to the salts obtained from a mineral water, the decomposition of the chemist furnishes but an indifferent and imperfect view of them, as they are associated by the hand of nature, since, as we have noticed already, some of them are, in all probability, produced by the process employed in reducing them to their simplest proximate elements ; the exact state indeed in which the salts exist in mineral waters cannot be discovered, but the doctrines of Berthollet regarding the influence of mass in modifying the force of affinities, would lead us to suppose, "that when several salts are dissolved in the same solution, (even those which do not decompose each other,) a certain

reaction ensues, each acid combining with a portion of each base, and there arise a series of compounds resulting from the reciprocal union of all the elements; the number of which is equal to the product of the sum of all the acids into the sum of all the bases." Dr. Murray found that the sulphate of soda and muriate of lime, could co-exist in a very dilute solution without decomposition, but by concentration a new arrangement took place, and hence inferred the errors committed by the results of the ordinary evaporation in the analyses of mineral waters. And it is a curious fact that, according to all analyses, when they can be supposed to have been executed with any precision, where the sulphate of lime exists, the muriate of soda is always present. Brande also found that the carbonate of soda and sulphate of magnesia do not decompose each other when each is dissolved in 60 parts of water, nor the carbonate of soda and muriate of lime when in 6000 waters. The only correct method, therefore, in forming a rationale of their effects, is to regard them in their original combined state, and as *acting*

as a single compound, of the operation of which, experience alone is to be most relied on. And, moreover, any single salt which might be selected as characterising a spring, from its predominance in quantity, or superior activity, may be found so modified by the presence of other subordinate ones, that its qualities are wholly disguised and its operation materially altered. Thus, *combination* of different substances, possessing similar effects, augments their *common* properties, and this fact applies to vegetable as well as mineral compounds and is well understood by physicians, and practised by cooks in their spiced meats, if we can credit Dr. Kitchener.

The sulphate of magnesia, or Epsom salts, is doubtless the predominant salt in the purging water at Scarborough, but its operation is greatly aided by its conjunction with other salts, and in a ratio beyond that which could be explained by quantity or similarity of property—it is indeed the union that augments their common effects, and gives to each, under such combination, increased power.

The temperature of the Scarborough waters being usually about 45° F. enables them to hold in solution a quantity of carbonic acid, and therefore to take up a larger dose of the insoluble earths, such as the sulphate and carbonate of lime, and the oxide of iron, than is met with in ordinary springs, and the temperature and iron may, together with the carbonic acid, be regarded as immediately tonic to the system, and as obviating the otherwise debilitating effects, in their daily use, of their aperient properties. All variable springs in this country are coldest at the end of spring, and warmest in autumn, reaching their highest temperature about September. But at Scarborough the mineral waters will seldom be found at any season, when examined as they emerge from the rock, to be higher than 47° or lower than 45°.

The presence of fixed air or carbonic acid gas in a mineral spring, performs an important part in its effects in many cases of delicate health, particularly those marked by gastric irritability. And it is important to know,

that the larger the proportion of gaseous matters, and the smaller that of the fixed, the more easily is the spring borne by the stomach, for should there be a large quantity of salts contained in it, oppression and nausea will be the common effects resulting from a dose in weak states of the digestive organs, particularly when unaided by the stimulus of presiding gas.

The North Well. I regard the mineral waters of Scarborough, as well as most others of the same description, as physiologically and therapeutically stimulant in their effects, and am confirmed in this opinion by the drowsiness, giddiness and obtuse pain of the head, sense of heat and prickling of the skin, and general fulness, often experienced on first taking them. This stimulant power may be directed to different organs in different degrees, and may not be appreciable to the individual as in the foregoing uneasy sensations, but may exercise its influence in exciting the capillary circulation, promoting the alvine and urinary secretions, and digestive functions, and operate indirectly

on the nerves generally, and through them extensively on the locomotive organs.

In the North Well, besides the fixed air and iron, there are sundry saline matters which modify its medicinal character as a pure carbonated chalybeate, but will not materially detract from the general effects and known tonic properties of such springs, and is not liable to the disadvantage arising from their constipating quality, and may be employed in a more plethoric condition of the body than that in which their use is generally advisable. The iron exists in it as a bi-carbonate of the protoxide, and from the minute division of its particles, by dilution, is presented over a large surface, to the sentient and capillary mouths of the absorbent vessels, and most likely directly absorbed into the circulating mass, in a manner that with the grosser carbonate in common use, is not found to take place. The exhilaration of the animal spirits accompanying its use, is most probably attributable to nervous stimulation, and primarily caused by the carbonic acid, which enables it

likewise to sit easy on the stomach.

Although the iron is the ingredient that characterises the North Well water, and constitutes it a chalybeate, yet the magnesia and lime are by no means destitute of medicinal power, whether we regard them as associated with the sulphuric, the carbonic, or the muriatic acid. For the reasons already assigned, it is probable that the lime exists naturally in the water as a muriate, although my analysis describes it chiefly as a carbonate and sulphate, being the products, probably, rather than the educts, afforded by the usual chemical manipulation.

This spring holds an intermediate character with the waters of Cheltenham and Leamington, of Tunbridge, Hastings, and Thetford, and Spa and Pyrmont. It possesses more iron than the first, but is not so purely chalybeate as the second, nor so acidulous as the third variety here mentioned. It has little aperient property, braces the solids, gives tone and vigour to the system, and passes off by the kidneys.

The South Well, or Purging Water. The Epsom salts and muriate of magnesia contained in this water, so predominate as to justify me in regarding it as belonging to the class of purgative springs, but in moderate doses its operation on the bowels is so gentle as not to occasion any griping or other uneasiness, which property is most likely referable to the presence and modifying power of iron and fixed air.

This well, with its admixture of purging salts, fixed air, and ferruginous ingredient, has been termed an aperient chalybeate, and is more particularly distinguished as the Scarborough Water. Its primary effects are relaxation of the bowels, and an increased flow of urine; hence it is refrigerant and antiphlogistic, but these effects are seldom accompanied with those debilitating consequences which attend the continuance, for a much shorter period, of an equal dose of artificial salts in our ordinary prescriptions, or even what are called factitious mineral waters.

Dr. Belcombe observes, in the fragment already alluded to, that the general effect of this water “when drank in a sufficient quantity, is to act gently on the bowels and kidneys, and sometimes on both, but without harassing or fatiguing, on the contrary, it strengthens and exhilarates.” He then enters upon a long catalogue of complaints in which it proves very serviceable, many of which are of opposite descriptions and very different in their nature one from another. Now, however, inconsistent *prima facie* this sort of arrangement may appear, it is founded in reason and supported by experience, and admits of some explanation by the circumstance of the water being impregnated with a variety of saline compounds, some one of which may be deemed appropriate for the particular case, although it is associated with other ingredients. Thus for example in one instance, the purgative quality of a mineral spring may be desired, and this to be effected with the smallest possible functional disturbance; in another case, the diuretic effect; in a third, its indirectly tonic power, or its depleting agency, or

with a view to use it as a refrigerative remedy, a febrifuge, an emenagogue, &c., all of which indications, it may, logically speaking, be calculated to fulfil, to the *extent of its known impregnation* of particular saline substances, and *ascertained effects*, but not further. The combination of several qualities in one water proves a great obstacle to the construction of a complete theory of its action, independent altogether of empirical views, but it is this property of mineral springs that gained for them the appellation of "a universal medicine," at a time when their mysterious origin was a good and sufficient plea for referring to them a thousand occult qualities, characteristic of the dawn of an enlightened philosophy, and when cures were effected in cases that had not yielded to other remedies, led men's minds to regard their effects as miraculous, or as instances of God's peculiar goodness to his creatures, so prone is erring human nature to attribute to the partial interposition of the Deity the effect of general laws, which its finite reason cannot comprehend.

The South Well-water may be said to hold an intermediate place in its nature and effects with the Cheltenham, Melksham, and Thorp-arch, the Seidlitz, Epsom, and Leamington, and the Hastings and Pyrmont waters.

All the preparations of iron are noticed to cause the fæces to be of a black colour, from the formation of the sulphuret of iron, of which all persons taking chalybeate waters should be apprized, lest the circumstance occasion alarm.

CHAPTER IV.

PRACTICAL DIRECTIONS.



The season of the year in which the Waters are principally taken. Climate of Scarborough, and its claim as a place well calculated for the recovery of health and strength. The complaints for which the North Well Water is to be used, with directions as to the quantity, time of day, &c. The South Well, or Purging Water. Complaints in which it is proper. Rules for drinking, &c.

Foret perutile quinimmo summopere necessarium, ut ii qui custodes sanitatis audiunt, et morbis mederi student, aquarum salutarium passim scaturientium genuinas et proprias vires imprimis probe et curate explorarent, quo ægrorum incommodis recte consulere possent.—

HOFFMAN.

The season during which mineral waters are employed, medicinally, usually extends from

the month of June to that of September inclusive. The summer and autumn are generally selected so as to combine the benefits of air, exercise, greater constancy and mildness in the weather, and the general exhilarating effects of this period of the year, when all nature is smiling and full of animation. This arrangement however is conventional, there being nothing so peremptory in it as to prohibit their use at any other period, provided the local peculiarities of the watering place, suit the strength of the invalid, and are appropriate for the nature of the disorder. In travelling to them the enfeebled patient should proceed slowly, and by short stages performed during the cool of the morning, carefully avoiding fatigue, mid-day heats, and evening dews, the frequent causes of feverishness, if not of renewed attacks of illness. At the end of the journey in such cases, the repose of a day or two is necessary, and may be employed in taking some preparatory medicines, should such be deemed advisable, previously to commencing a course of the waters.

But since the great bulk of visitors frequent Scarborough, for the advantage of the sea-baths, and invigorating sea-breezes, as well as for the benefit of the springs, it will not be out of place, if I devote a few lines to a brief exposition of the climate of the place and its claim as productive of health, and this may be accomplished with least tedium to the general reader, by condensing the information furnished by Doctor Belcombe, to Hinderwell's own edition of the History of Scarborough.

“The effect of climate upon health and longevity is a very curious and deeply interesting topic, and has only of late years engaged the attention of philosophers and physicians. Its effects, however, are with difficulty appreciated, being combined with many other circumstances. But if we doubt as to the effects of climate, we can have no hesitation in pronouncing upon the healthfulness of particular situations, however great or small the population. Neither can we dispute the singular effect of change of place, and air, although the intermediate distance be very

small, and the aspect, elevation, &c., be nearly the same.’”

With respect to longevity, it is stated that in January, 1796, six persons were interred whose united ages amounted to 481 years, out of a population of 7,000; and that the average mortality between the years 1801 and 1811, was one in forty-seven, per annum, which at a time when vaccination was not so extensively adopted, and medicine not so successfully practised as at present, is remarkably small.

“The town owes its salubrity in a great measure to its situation upon the acclivity of a hill, lying exposed to the sun, well brushed by southerly and south-westerly winds, and ventilated by the current of air which accompanies every flowing tide. The spring months, March, April, and May, as is the case all over this island, are commonly the least agreeable of the year. The vernal monsoon from the east, generally sets in with violence, and often continues to blow, with little intermission, for six or more weeks, sometimes envel-

oping us with sea fogs, suddenly changing the temperature 8 or 10 degrees. I have frequently observed these fogs to rise from the sea like a little cloud, which spreading itself on the horizon, drives upon the shore, and in an instant obscures the brightest day. They seldom extend far from the coast, often not more than a mile, and rarely farther than the neighbouring hills. Coming into a sea-fog, from the sunshine of a clear day, resembles entering an ice-house in summer. The north-east winds are very keen at this season."

"Spring reluctantly yields to summer, which at this place is delightful. Although we boast of few shaded woods, our atmosphere is generally temperate and cool, resembling the winters of the southern parts of Europe. The oppressive heats to which inland watering places and others on the southern coast of England are subjected are seldom experienced here. Like islands within the tropics, we have our diurnal sea breeze, commonly setting in about noon and continuing until evening, wafting health and refreshment all around.

The sands are enchantingly cool, and the ride close to the edge of the sea is sought with avidity, while the Cliff and Spaw Terrace are crowded with beauty and fashion. At this season, few places can boast a climate so agreeable or salutary to valetudinarians. Sea bathing at this season of the year is a great luxury, and when succeeded by the enjoyment of the sea breeze, excites the most agreeable sensations. Summer here encroaches a full month upon autumn."

"In autumn the air is serene and bracing, and the atmosphere for the most part clear, and may be considered, perhaps, the most agreeable time of the year in most parts of England. The monsoon now begins to blow from the south-west, and it is generally repressed by violent but transient gales from the north-east. The intervals are usually fine and healthful, often continuing for many weeks, and thence called a Michaelmas summer. No period of the year is more favourable for sea bathing, which may be often pursued with signal advantage to the middle of December. The

temperature of the sea is now gradually decreasing and the bracing effects are consequently greater. Exercise too may be more freely taken, and the habit fortified for the winter. Sometimes the equinoctial gusts scare from our cliffs the affrighted stranger, who, in idea, beholds the stiffening hand of winter already at our door. Let him but wait a few days, the storm which lifts the billow to his dwelling subsides, and a succession of clear open weather prevails, often protracted to Christmas."

"Our winters are milder than places in the same parallel of latitude, whose situation is more inland. We have in general less rain than our neighbours; the wolds on the south, and the high moors on the north, drawing away many showers to the right and left. It is universally observed that frost is less severe near the sea, and that snow seldom lies there long. During winter we have oftentimes many beautiful days, which resemble those of more southern climates."

In the foregoing chapter I entered into a recital of the effects of the mineral waters of Scarborough, as deduced from experience, and on those general principles of therapeutical agency, commonly resorted to in the explanation of the *modus operandi* of other remedies; but it is by no means affirmed that these reservoirs of healing efficacy are to be generally regarded as substitutes, still less as equivalents, in active disease, for other remedies, and lest I may be supposed to overrate their qualities, it is necessary here, distinctly to state, that I look upon them as oftentimes substitutes, but still more frequently as valuable auxiliaries in the cure of chronic complaints, in that class and form, which embrace by far the greatest number to which flesh is heir. Nor, on the other hand, would I undervalue the aid afforded during a course of them by the local advantages of climate, the exercise with which they are usually taken, the change of air, scene, and occupation, and the hundred other concomitants presented to the observation of the invalid visiting a watering place. They must not be relied on in maladies occurring in

plethoric habits of body, which assume an inflammatory or febrile type; neither are they suitable in disordered states of the stomach and bowels, particularly if dependant on biliary derangements, till these are rectified by more appropriate remedies. When their taste and temperature are extremely repugnant to the feelings of the drinker, they will seldom prove beneficial, but these qualities may often be obviated by adding a teaspoonful of brandy or of some aromatic tincture to them.

The North Well, or Chalybeate, is found in an excavation of the Spaw-Terrace, at the foot of the bridge and south cliffs, and is the first met with on descending those steps near the lodge or hut appropriated to the water-servers. The water is perfectly clear, of a bluish hue and sub-astringent or inky taste, and sparkles a little when poured from one glass into another, owing to the escape of some of the fixed air or gas, with which it is charged, and hence, to reap any material benefit, it should be drank at the fountain, as agitation in conveyance deprives it of this

property, together with a portion of the iron which is, indeed, held in solution by it.

When this water *agrees*, it will not cause nausea or oppression of the stomach ; a moderate dose is shortly followed by an increase in the strength and frequency of the pulse, and a sense of warmth is experienced. Its ultimate operation, when continued for a length of time, is marked by a gradual improvement in the tone of the secretory system, and by the permanency of its tonic power, augments the strength and nervous energy, and promotes the vigorous performance of those functions essential to life and health. Hence it promises to be efficacious in complaints characterised by inertia of the nervous system, and torpor of the digestive organs. It will prove useful too in allaying that irritability and morbid excitement which is dependent upon debility and relaxation of the body, from whatever cause it springs.

It affords a good remedy in impaired and capricious appetite, irregular digestion, flatu-

lent distension of the stomach, arising from debility of the assimilating organs, in chlorosis, when conjoined with the employment of the warm sea bath, and in all cases of weaknesses unconnected with inflammatory symptoms or visceral obstructions.

Doctor Belcombe observes "the North Well water has little or no opening quality. In all cases of general weakness and relaxation its virtues are acknowledged. And I observe that the water-servers generally recommend it to the delicate of their own sex, and I believe with good success. It is peculiarly useful in a variety of nervous cases; particularly those consequent to confinement, dissipation, and a town life, where the bowels require no assistance. It is likewise serviceable in those very numerous cases, which occur to females at that time of life, when the growth seems disproportionate to the strength. This complaint is mostly distinguished by a pale complexion, depraved appetite, weariness and pains in the limbs, palpitations, &c."

Few complaints could be named in which this and similar waters, are not said to have worked wonders, but we may dispense with such traditional and extravagant eommendations, and admit that in the graver forms of disease, they are not to be trusted except at most as auxiliaries. In my own very limited experience, I am in the habit ehiefly of recommending this spring to those who are suffering from the relics of previous illness, and the resulting debility consequent on severe and active forms of complaint. Its application, therefore, with me is not very extended. In Indigestion, however, it oftentimes exerts a very benefieial influence, probably owing to the stimulus excited by the fixed air and the iron, upon the nervous papillæ of the stomach, together with the regular exercise usually accompanying a course of it. In a case of Epilepsy, unconnected with organic lesion, I used this spring with the effect of procuring a longer interval between the fits. My eminent brother, Dr. Alexander, of Manchester, who wrote on Pulmonary Consumption, recommends earbonated ehalybeates when the premonitary symptoms of

that complaint have been subdued by his treatment, which consists in general, of daily emetics, and perpetual blisters on the chest. In *Tic-doloureux*, unconnected with affection of the brain, a course of this water may be salutary.

RULES FOR DRINKING THE NORTH WELL WATER.

Some persons experience much uneasiness from the quantity of cold water recommended to be taken upon the stomach. Delicate invalids, and those to whom simple water in any form is an uncommon beverage, suffer most from this cause, but to obviate this, the doses should be small, and repeated at longer intervals, and peppermint lozenges taken afterward, or a teaspoonful of tincture of lavender or cardamom mixed with the water.

In biliary derangements this water ought not to be commenced with, until preparatory means have been used, and these, in general, should coincide as nearly as can be with the intention of the water and object in the removal of the complaint. In many cases in which

an aperient is deemed necessary, the ordinary family pill, or the Pil. Rhæi Co. will suffice for this purpose.

When the intention of this water is to strengthen the body, and act simply as a tonic, a tumbler glassful may be taken at any time of the day, but when a course of it is desired, it should be taken in the morning before breakfast likewise in such cases, as it acts with most effect upon the constitution, when fasting, between seven and ten o'clock. In general it should be taken early in the morning, and may be carried to three or four well glassfuls, at intervals of a quarter of an hour, occupied in exercise.

A full course may be said to extend to six weeks, but it will be known to have a beneficial effect, if after a shorter time, the strength is improving, the appetite good, and food relished, and digestion easily performed, and to obtain the full effect of a course, it is necessary, that exercise in the open air should be daily taken, that the diet should be mild and

nutritive, and the general hours and habits of life regular.

The South Well, or Purging Water, is situated within a few feet of the one already described. Its sensible properties are not dissimilar, though the taste is perhaps rather more saline and bitter, and less ferruginous.

The effects of this spring, when first taken, are irregular, sometimes producing drowsiness and headache, symptoms, however, which speedily disappear. When taken in too small a quantity to act upon the bowels, it generally determines to the kidneys and skin. In larger doses it has a speedy operation on the intestinal canal, and effects this object without griping or leaving any languor or debility. Its tendency to preserve the bowels in a solutive state, renders it a convenient remedy for habitual costiveness, and for its frequent accompaniment, the piles. It will indeed prove serviceable in many cases requiring a continued, though gentle, action, upon the alimentary canal. Thus, some affections of the head,

commonly marked by depression of the spirits, and dark coloured alvine-evacuations, will be benefited by a course of it. Worms also will be expelled, being first deprived of vitality by the ferruginous ingredient, which to many tribes of them is poisonous. It will be found useful in subduing stomach complaints, by diminishing the pernicious effects of acrid matters lodging in the intestines, and by removing the load of undigested food from the debilitated stomach, without at all weakening the digestive organs.

Artificial remedies, possessing any *power*, in general excite an action which the system is unable long to sustain, particularly when already undermined by the treacherous advances of a disease, the early symptoms of which too often steal upon, and lurk unobserved by its unwary victim, until at length we become sensible of the serious injury we have received. Such is one form of chronic disease, as it often presents itself to the observation of the physician; and it is that in which mineral waters are much recommended, so as to stay the morbid

action, without loss but augmentation of strength, and if possible resolve, penetrate, and remove, those obstructions of the different organs, which sedentary, studious, or irregular modes of life, or other particular causes, have gradually induced. In such cases, therefore, it must be obvious, that it is a matter of some moment to select such remedies, as while they gradually subdue the complaint, rather add to, than impair the strength. Acute maladies, too, have chronic stages, particularly if they are not treated early, and opposed by active means. It is evident then that chronic forms of complaint constitute a large class of those to which we are exposed, and that natural waters have an extended application to them, when judiciously administered.

This water has been much esteemed in certain cutaneous complaints, which in popular language, are termed scurvies, and is useful in many affections marked by depraved habit. And from its aperient property, and the known importance of the regular performance

of the functions of the stomach and bowels in the establishment and maintenance of health, it is applicable to a number of other miscellaneous forms of illness, as will now be expressed in the language of Doctor Belcombe, who had ten years experience in its use. “The South Well-water is serviceable in *debility*, and *relaxations of the stomach*, in *nervous disorders*, *scurvy*, *struma* or *swelled glands*, *chlorosis*, and *particular weaknesses*. I have found it very useful in a variety of *chronic* complaints, attended by *habitual costiveness*. These complaints are often accompanied by some degree of *jaundice*, or are frequently subsequent to it; to a *sedentary life*, to *long continued* and *painful affections of the mind*, to long and *tedious illness*, to *agues*, to residents in *hot climes*, and sometimes to *intemperance*. In such cases, I have known a glass of this water repeated every day for some time, produce the most desired and permanent effects, even when very powerful medicines have not been found to answer, or only to afford temporary relief. Most commonly, however, two, three, or even four half pints, taken at proper intervals,

and repeated daily, are required, although no very great constipation may have preceded. It sometimes affords relief in the *gravel*, as well as in several pains of the *loins*, whose seat seems to be in the kidneys, although they are generally called Rheumatic. Diseases commonly comprehended under the appellation of scurvy, as *pimples*, *red face*, *eruptions* in various parts of the body; *roughness* of the *skin*, or *scurf*, &c., are often cured by a long continued use of the South Well-water. Some remarkable instances of this kind have come to my knowledge, both in the inhabitants of town and in strangers. In these disorders so much water should be drank daily at proper intervals, as will produce some sensible effect upon the bowels."

From the mildness of its operation compared with many of our artificial remedies, I see no well-founded objection in its use to obviate the torpid state of the stomach, so troublesome during pregnancy. Generally speaking, a course of these waters is not well adapted for very old persons, and still less for young children under *ten years of age*.

Waters similar to this issue from various points of the Cliff, and these are used chiefly as external applications to sore eyes, and to strengthen the union of bone after fracture. They owe their virtue in such cases probably to temperature.

RULES FOR DRINKING THE CHELTENHAM, OR SOUTH
WELL WATER.

An advantage attends this water in common with many others possessing purgative properties, that it may in general be used at once without any preparatory artificial, or resolvent remedies. But there are some plethoric states of the body, in which this water will distress the head, and disturb the functions of the stomach, unless the bowels have previously been excited to action by suitable aperients. In such cases, however, a family pill may be taken at bedtime, and succeeded by a teaspoonful of salts, or a Seidlitz powder thrown into a glassful of the water the following morning, with very good effect. In other instances unattended with full habit, it may be had recourse to at once, and should a sense

of coldness, oppression, nausea, or flatulence, occur at first from its use, it will be alleviated by taking peppermint lozenges or a teaspoonful of some aromatic tincture mixed with it, as already recommended in the case of the North Well-water.

The waters ought not to be warmed, as in their cold natural state they better brace the stomach and cool the body, and, moreover, they lose a part of the medicinal power of the ingredients by being heated.

It is of more importance that this water should be taken in the early part of the morning than the other, and with exercise in the intervals of drinking. The dose of this water must depend much on the age, sex, constitution, and object in view in taking it. A robust individual may take twelve ounces or a well-pint at a time, and repeat it at intervals of a quarter of an hour, to the extent of three or four glassfuls, according to the effect desired. One glassful, at two doses, may be sufficient for a young person or delicate invalid.

Those who both bathe in the sea and take the waters, should do so on alternate days, but the warm sea-bath, or the douche, may accompany the internal use of these waters on the same day, and will often prove valuable auxiliaries to them. The tepid affusion or douche of brine will indeed be found an admirable means, together with small doses of the chalybeate, in restoring health and re-establishing the strength in those who have become much reduced and wasted by previous illness. The efficacy of the douche may be encreased by friction with the hand, either naked, or armed with a flannel.

This water should in general be taken early in the morning before breakfast, as it acts with greatest advantage on an empty stomach, but when the strength forbids early rising or exposure to the chilly morning air, it may be taken three hours after the first daily meal. Exercise, and by this is here meant walking, and regular habits of life are necessary, and should be observed by all invalids resorting to a mineral spring. Late hours, depressing

affections of the mind, and midnight mental exertion are carefully to be avoided.

The diet must depend much upon the nature of the ailment and the previous habits of the invalid. Tea and Coffee are objectionable as forming the breakfast, if taken *soon after the waters*. Milk and bread, or cocoa, or chocolate, are nutritious, and generally recommended for those drinking chalybeate waters. When these do not suit the irritable and enfeebled stomach, a dish of *water gruel* with *dry toast* are most suitable. During the rest of the day the diet should be light and wholesome, avoiding flatulent food, malt liquors, and the pulp of fruits, which are liable to disorder the stomach.

CHAPTER V.

EFFECTS OF SEA WATER.



The ocean the receptacle of all waters. The composition of the sea, with the recently discovered active ingredients. Brine Springs. Effects of Sea Water taken internally. Efficacy of Sea Water in the complaints of children. Doses, &c. &c.

Sea salt is a material peculiarly agreeable to the taste of mankind, as well as to many other animals; perhaps it is necessary to the support of their existence.—BUCHAN, on Sea Water.

Since the sea is the common receptacle for all the waters which traverse the surface of the earth, it might be supposed to contain a portion of all the soluble matters of which the crust of our globe is composed; but such an opinion is unsupported by chemical analyses, and opposed to reason, when it is considered

the small proportion which river and spring water bear to the great ocean, and that the water of the sea, already saturated with saline matters, is not in a favourable state for further solution. Potash, Iodine, and Bromine, in addition to other known substances, have however, of late years been detected in it, and moreover, it is a very heterogeneous compound near the shore and at the mouths of great rivers, where, besides the suspension of muddy particles, it contains various animal and vegetable matters, which render it impure and unfit for preservation. In extent of saline impregnation it exceeds all other waters, and according to the results of chemists, varies in different seas, being stronger in brine within the tropics, in the Mediterranean, the Dead Sea, and in the Baltic, than other parts hitherto examined. A curious fact, too, is stated by Doctor Marcet, with respect to the temperature in the arctic and tropical seas, that in the former it increases, and in the latter decreases, with the depth. This singular, though perhaps not altogether unaccountable circumstance, was first discovered by Mr. Scoresby, and is confirmed by later observers.

In giving the composition of sea-water, the analyses of Lavoisier, Bergman, Higgins, and Vogel and Lagrange, are usually referred to, but as the results differ as well in quantity of saline matter, as in the combination of the acids and bases, it will be unnecessary to enter into any exposition of its constitution, but confine ourselves to the consideration of its medicinal properties, which are found much to depend on its aperient qualities when taken in large doses, and the effects of the muriates of lime, soda, and magnesia, when in small ones. Doctor Murray, indeed, demonstrated that the ingredients found, as well as their relative proportions, may be varied at pleasure, according to the process employed in the investigation. Analysis must not be regarded as an *experimentum crucis*. The lime probably exists in the water naturally as a muriate, but the chemist, as was stated to be the case with mineral waters generally, finds it as a sulphate, most likely owing to the reaction of the sulphate of soda and magnesia upon the muriate of lime during the evaporation. The muriates of soda and magnesia may be deemed the fixed and

chief ingredients, but Bromine and Iodine are substances of great power, and although they exist in sea-water in almost inappreciable quantity, yet they may exert some effect, and be entitled to some share of its well known virtues. The brine spring of Ashby-de-la-Zouch, in Leicestershire, and others of the same class, which most nearly resemble sea-water, and serve as connecting links between the modern, and those remnants of the ancient ocean, which form immense rocky masses in the bowels of the earth, have been long celebrated in scrofulous disorders, and are found to contain Bromine, which appears from its highly poisonous qualities to be any thing but an inert agent even in very small doses, exemplifying the well known axiom in therapeutics, that a remedy must be capable of much harm to be enabled to do much good. Doctor Daubeny found this active principle in this country, to occur in largest quantity in the brine springs of Middlewich, in Cheshire, amounting to 1.337 in 10,000 parts, in combination, as an hydro-bromate of magnesia. Bromine and Iodine were first detected in

the Mediterranean, by Balard, and subsequently found in the Baltic, German Ocean, and Dead Sea, and most likely exist universally in sea-water.

When pure, sea-water is clear, colourless, destitute of smell, and has a saline, bitter, and to some a nauseous taste. When taken to the extent of half a pint and upwards, it is stimulant to the stomach, usually excites a little thirst, particularly in warm weather, and sometimes occasions, at first, disorder of the digestive organs, in persons of an irritable or bilious habit. If taken in that quantity upon an empty stomach, it commonly proves purgative.

Sea-water seems to exert a peculiar and happy effect distinct from its aperient properties, in *glandular affections* of a scrofulous character, acting, it is presumed, as a stimulant to the absorbent system, and exciting the dormant energies of the constitution.

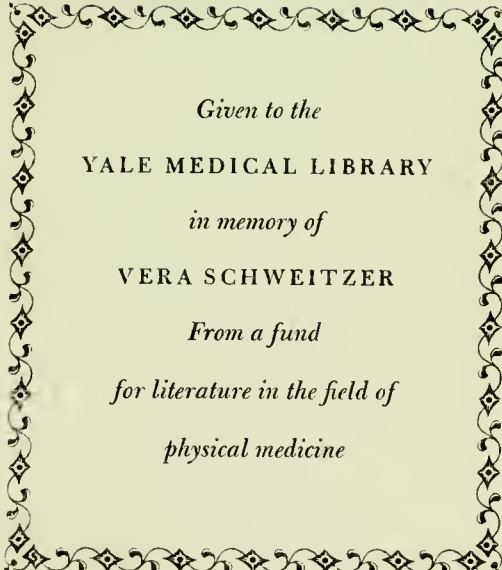
It is in many cases a remedy of infinitely

greater power and efficacy, than the spaw-waters, and is admirably suited to *children*, for the *promotion of health and growing vigour*, for the *expulsion of worms* infesting the bowels, and for the removal of *mesenteric glandular obstruction*, marked by pale countenance, emaciated limbs, distended stomach, and capricious, though generally voracious, appetite. Infants of all ages are liable to this often fatal complaint, but I have seen the best results follow the use of sea-water, in small quantity, mixed in their milk, together with a gentle mercurial (Hyd. c. Creta) course, and washing the body every morning with brine.

For children between two and six years old, a *wine glassful* twice a day in such cases is sufficient. For expelling worms, the water should be taken *before breakfast*, in a quantity sufficient to affect the bowels, and repeated every alternate morning. For purposes of general health in children as well as adults, *once a week* may be often enough, as it produces an increased action of the bowels, which continues to last some days.

I am in the habit of recommending it as a tonic and alterative for adults, in cases of *debility*, arising from previous illness, attended by *torpor* of the functions of the stomach and bowels. In *Leucorrhæa*, unaccompanied by febrile symptoms, in *chlorosis*, some *visceral obstructions*, *chorea* occurring in children, and in some cases of *indigestion*. In all these instances the dose usually is a *wine glassful every night* at bedtime, which neither operates as a purgative nor creates thirst, but preserves the bowels regular, amends the appetite, promotes digestion, and improves the general health.

FINIS.



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